

SEX-RATIO AND SPATIAL DISPLACEMENT IN CONGER CONGER (L.)

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**Resumé** - Plus de quatre ans de pêche au chalut et au palangre de l'Anguilliforme Conger conger (L.) dans les eaux qui entourent la Sardaigne ont permis:

- a) la localisation d'une aire de reproduction située au sud-est de la Sardaigne entre 600 et au moins 800 m de profondeur.
- b) d'établir que la coloration varie en fonction du stade de maturité des gonades.
- c) de décrire le dimorphisme sexuel; les mâles dépassent rarement la longueur de 100 cm, tandis que les femelles peuvent dépasser les 200 cm.
- d) d'établir que le rapport sexes ( $\frac{\text{♂♂}}{\text{♀♀}}$ ) tend vers zéro jusqu'à -400 m et qu'il est voisin de 0,5 entre 400 et 800 m de profondeur

**Summary** - More than 4 years of fishing by trawl-nets and fishes-hooks of the eel Conger conger (L.) in middle southern Sardinian seas and in Sardinian channel have allowed:

- a) to locate a reproductive area in Sardinian channel between 600 at least 800 m of depth.
- b) to ascertain that the coloration varies in function of the stage of gonadal maturation.
- c) to describe sexual dimorphism; only seldom male specimens are longer than 100 cm, while the female ones can be longer than 200 cm.
- d) to clear the sex-ratio fluctuation in function of depth; it tends to 0 till to about -400 m and it's near 0,5 between -400 and -800 m.

It is well known the conger eel, Conger conger (L.), benthic species commonly found on sandy and rocky coasts (BLACHE and al., 1973), reproduces also in the Mediterranean (SCHMIDT, 1924). However, the location and depth of the reproduction areas have not been reported and information on many biological aspects of this species is scarce.

Thus, the present study was carried out to determine the reproduction area and to describe some biological aspects of the conger reproduction. The study was carried out in the seas around central-

southern Sardinia and the Sardinian Channel, with samples taken till a depth of -800 m.

**Reproductive area** - To the south-east of Sardinia at about 70 miles from the coast was the site of sampling at a depth of between 400 and 800 m. In the spring months, between -600 and -740 m in this area, male and female examples with gonads of both sexes and morphologically mature gametes were caught. Only later (October), in the same area, were caught males with gonads without gametes, which are considered as individuals which had already deposited their mature germinal cells. Many examples showed loss of teeth and bone decalcification. On this subject, it should be remembered that sexually mature individuals have never been caught (LYTHGOE and LYTHGOE,1973). The above data suggest that we have found one of the C.conger reproductive areas to the south-east of Sardinia between 600 and at least 800 m in depth. This data is in disagreement with that of SCORTECCI(1967), who claimed that the females would deposit their sexual products near the shore where the males would inseminate. On the other hand, there is only partial disagreement with that reported on the Atlantic populations, which reproduce at between -3000 and -4000 m (LYTHGOE and LYTHGOE, 1973).

The reproduction area here reported is similar to that of other eel-forms, i.e. Nemichthys scolopaceus and Nettastoma melanurum (CAU, 1978;1981).

**Sexual dimorphism** - Sexual dimorphism and morphological changes in maturity are well-known for some eel-species such as Anguilla, Moringua and Nemichthys (SCHMID,1976). These two phenomena, do not seem to apply to C.conger. The study of a large sample of this species, however, indicates a higher mean weight in mature females than in mature males. The size-weight ratio ( $W = bL^a$ ) is shown in Table 1.

♂♂	♀♀
$a = 2,594 \pm 0,175$	$a = 3,403 \pm 0,086$
$b = -2,202$	$b = -3,542$
$r = 0,902$	$r = 0,969$
$n = 53$	$n = 104$

Tab.1 - Size - weight ratio:  $W = aL^a$  : r = correlation coefficient; n = number of specimens.

The difference between regression coefficients of the two sexes is

highly significant ( $t = 26,765$ ). Males are rarely over 100 cm, while the females may be over 200 cm. The catching of examples of about 300 cm long and over 60 Kg in weight has been reported in the literature. Melanic examples of C. conger have stimulated interest of many Authors (BINI,1970), who believed them to belong to a deep-sea population if not to a different species. In reality, the coloration of C. conger varies in function of the stage of gonadal maturation. Individuals which are sexually indifferiated or slightly differentiated have grey backs, white sides and have a black-rimmed dorsal fin. On the other hand mature individuals have a completely black back, less marked pigmentary areas on their sides and larger eyes than the younger examples have.

Sex-ratio - ( $\frac{\delta\delta}{\text{oo}}$ ) of the population studied (both neritic and-epi-mesobathyal) was, on the whole, 0,32. However, this ratio varies between different groups caught at different depths. It should be considered that, in Italian seas, this species is found between -10 and -1000 m (TORTONESE,1970). From over 4 years of fishing with dragnets and fishes-hooks, resulted a complete absence of males on the continental shelf and in the transition zone of the continental slope. Male examples, with not yet mature sexual products, were caught from -400 m. In spring at greater depths (over -550 m), some males with mature spermatozoa can be found, other than sexually indifferent and mature and immature female individuals. In this area the sex-ratio was 0,53.

From this data, it seems that the sex-ratio tends from zero at about -400 m and is approximately 0,5 from -400 to -800 m. The bathic dislocation of this species can be interpreted as follows: a complex of individuals (with sex ratio near 1) has its life cycle in deep-seas (from -400 -1000 m); during the reproductive period, this group is joined by new individuals, exclusively female which, after having completed the trophic phase in neritic waters, proceed to the reproductive areas. Thus, the sex-ratio is lowered. Considering this model, the hypothesis of BERTIN and ARAMBOURG(1958) seems improbable. These Authors proposed that the "young conger eels" tend to remain near the coast and as they grow move towards deeper areas. On the other hand, the juvenile forms, after metamorphosis, would be casually distributed in trophic areas between 0 and -1000 m.

The presence of exclusively female individuals on the neritic seabed suggest the possibility of some environmental influence on gonad differentiation in individuals in the juvenile phase.

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